

Lecture Module - Data Acquisition

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering

Tennessee Technological University

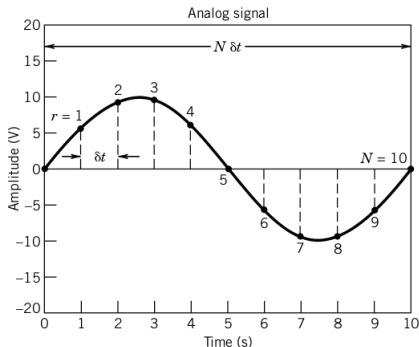
Topic 3 - Sampling and Aliasing

Topic 3 - Sampling and Aliasing

- Sampling
- The Aliasing Phenomenon
- Example by Hand
- MATLAB Example

Sampling

... A discrete time signal usually results from the sampling of a continuous variable at repeated finite time intervals. ...



Discrete time signal	
$\{y(r\delta t)\}$	
r	Discrete data
0	0
1	5.9
2	9.5
3	9.5
4	5.9
5	0
6	-5.9
7	-9.5
8	-9.5
9	-5.9
10	0

Sampling

some reference

The Aliasing Phenomenon

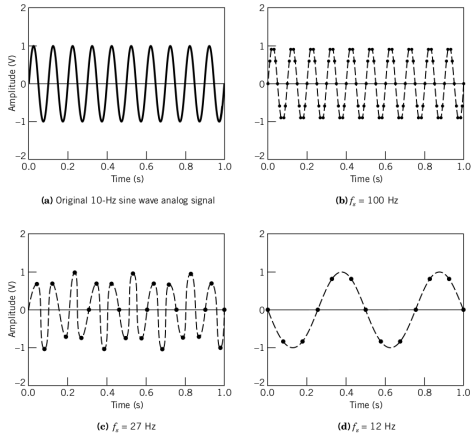


Figure: Theory and Design for Mechanical Measurements Ch. 7

Example by Hand

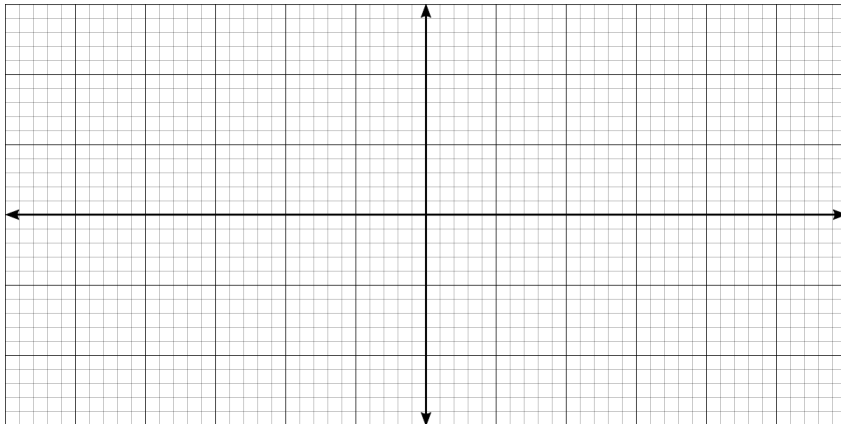


Image: T.Hill

Example by Hand

some reference

MATLAB Example

% ME3023 - Tennessee Technological University
% Tristan Hill - October 10, 2019 - April 14, 2021
% Data Acquisition Topic 3 - Sampling and Aliasing

```
clear variables; close all; clc
```

```
% simulate a continuous signal
```

```
A1=5; f1=3;
```

```
w1=2*pi*f1;
```

```
dt_sim=0.001; t_stop=6;
```

```
t_sim=0:dt_sim:t_stop;
```

```
y_sim=A1*sin(w1*t_sim);
```

MATLAB Example

```
% simulate sampling the signal
dt_sam = 0.3;
t_sam=0:dt_sam:t_stop;
y_sam=A1*sin(w1*t_sam);

% show the figure
figure(1); hold on
plot(t_sim,y_sim,'-',t_sam,y_sam,'o')
axis([0 t_stop -1.2*A1 1.2*A1])
grid on
```
